EOS Science Networks Performance Report

This is a summary of EOS QA SCF performance testing for the 2nd and 3rd quarters of 2012 -- comparing the performance against the requirements, including Terra, TRMM, QuikScat, Aqua, Aura, ICESat, NPP, and GEOS requirements.

This report incorporates a major change in the source of requirements. Previously, the Nov '07 requirements were used as the basis for the ratings. This report switches to the EOS network requirements database (a long awaited change). This database is in turn based on recently revised ICDs with the instrument teams. Accordingly, several sites have been dropped from this report since there are no longer requirements for them: University of Arizona, UCSD, Colorado State, University of Miami, University of Montana, SUNY Stony Brook, and the University of Buffalo

There are several sites with new requirements – the only ones which have participated in network performance testing so far are Oak Ridge National Lab and the University of Hawaii. Additional sites with requirements, but not tested are University of Washington, JRC, Ispra, Italy, JAXA, Japan, and the University of Auckland, NZ.

Current results can be found on the EOS network performance web site (ENSIGHT): http://ensight.eos.nasa.gov/active_net_measure.html. Or click on any of the site links below.

Highlights:

- Mostly stable performance.
  - **All nodes rated at least Good (all but one Excellent!)**
  - **GPA 3.93** (was 3.89 last quarter)

Ratings:

Rating Categories:

Excellent: median of daily worst cases > 3 x requirement

Good: median of daily worst cases > requirement

Adequate: median of daily worst cases < requirement
and
median of daily medians > requirement

Almost Adequate: median of daily worst cases > requirement / 1.5
(i.e., requirement without contingency)

Low: median of daily medians < requirement / 1.5.

Bad: median of daily medians < requirement / 3.

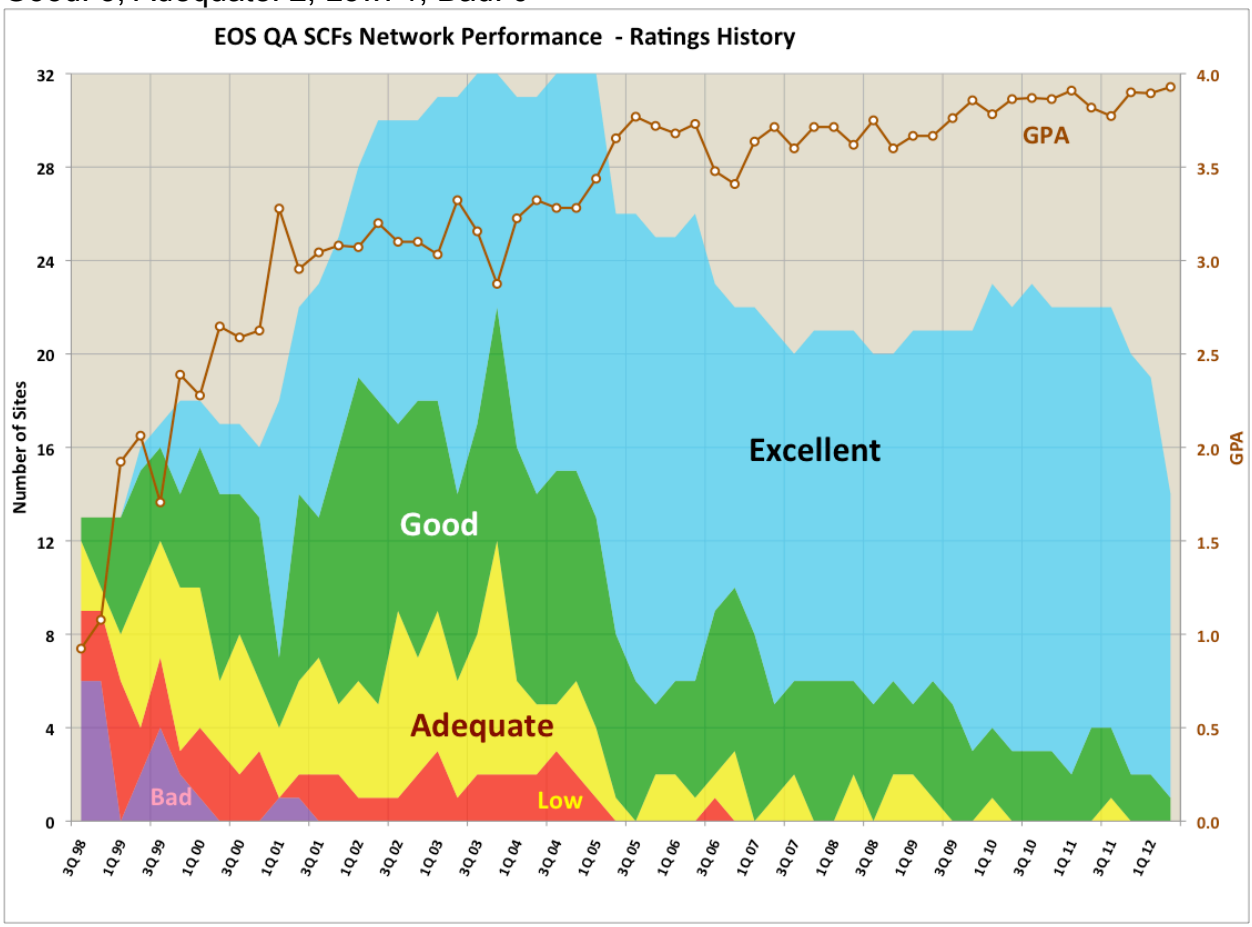
Ratings Changes:

Upgrades: ↑ **Oxford, UK: Good → Excellent**

Downgrades: ↓ None

Ratings History:

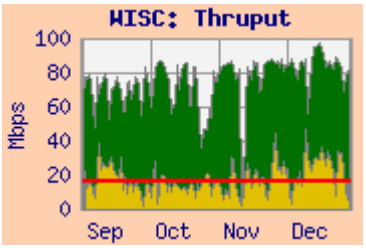
The chart below shows the number of sites in each classification since the testing started in 1998. Note that these ratings do NOT relate to absolute performance -- they are relative to the EOS requirements. The GPA is calculated based on Excellent: 4, Good: 3, Adequate: 2, Low: 1, Bad: 0



Notes: The number of sites included in this chart has changed since 1Q'05 due to:

- 2Q05: Moving the reporting for 6 SIPS sites to the "EOS Production Sites" Network Performance Report.
- 2006: Testing discontinued to SAGE III Nodes, NOAA, UMD, UIUC
- 2Q07: Testing discontinued to U Washington
- 1Q09: Testing added to BADC (RAL).
- 2010: Testing to Oxford restored, ICESAT functions of Ohio State were transferred to Buffalo, testing to Buffalo added, Testing to Ohio State discontinued.
- 3Q10: UIUC added [back]; Testing to MIT discontinued
- 2Q11: Testing discontinued to LANL, PNNL; requirements added to CCRS and Univ of Auckland
- 4Q11: Testing to JRC discontinued, Wisconsin moved to production sites report.
- 1Q12: Testing to Univ Auckland, NZ failing.
- 2-3Q12: Discontinued testing to Arizona, UCSD, Colo State, Miami, Montana, SUNY SB, and Buffalo – no longer any requirements. Added testing to Hawaii, ORNL.

Integrated Charts: Integrated charts are now included for selected sites with the site details. These charts are "Area" charts, with a pink background. A sample Integrated chart is shown here. The yellow area at the bottom represents the daily average of the user flow from the source facility (e.g., GSFC, in this example) to the destination facility (e.g., Wisconsin, in this example) obtained from routers via "netflow". The green area is stacked on top of the user flow, and represents the "adjusted" daily average iperf thruput between the source-destination pair most closely corresponding to the requirement. This iperf measurement essentially shows the circuit capacity remaining with the user flows active. The adjustments are made to compensate for various systematic effects, and are best considered as an approximation. The red line is the requirement for the flow from the source to destination facilities.



Note: User flow data is has not been available from LaRC since March 2007, so sites with primary requirements from LaRC will not include integrated graphs. (But JPL ← → LaRC flow data is available from JPL, and GSFC ← → LaRC is available from GSFC).

EOS QA SCF Sites Summary: Network Requirements vs. Measured Performance

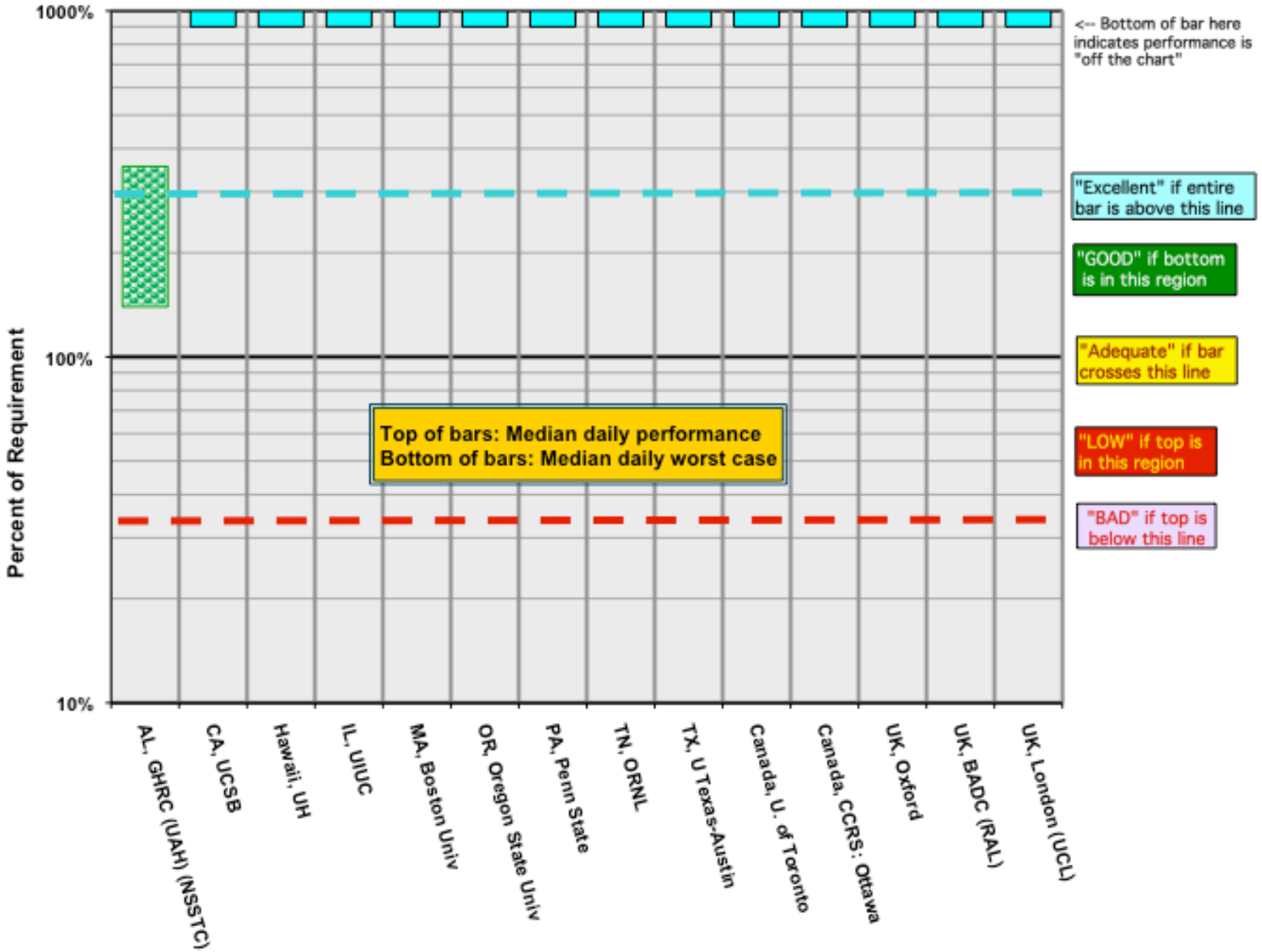
2nd & 3rd Quarter 2012				Testing							
Destination	Team (s)	Requirements		Source Node	Median Daily Best	Median mbps	Median Daily Worst	Average User Flow	Rating re Current Requirements		
		database	Nov-07						2-3 Q 2012	1Q12	Route Tested
AL, GHRC (UAH) (NSSTC)	MODIS, LANCE	2.9	6.9	GSFC-EDOS	22.3	10.3	4.0		Good	Good	NISN - MAX - Internet2 - SOX - UAH
CA, UCSB	MODIS	0.17	3.1	GSFC-MODIS	87.6	67.9	45.6	1.73	Excellent	Ex	EBnet - MAX - Internet2 - CENIC
Hawaii, UH	MODIS	0.02		GSFC-ENPL	322.6	138.5	83.8		Excellent		EBnet - MAX - Internet2 - LA
IL, UIUC	MISR	0.56	1.1	LaRC PTH	185.4	183.4	176.2		Excellent	Ex	NISN - MAX - Internet2 - StarLight (Chicago)
MA, Boston Univ	MODIS, MISR	2.6	3.0	GES DISC	373.6	316.3	214.0	3.6	Excellent	Ex	StarLight (Chicago) - Internet2 - NOX
OR, Oregon State Univ	CERES, MODIS, MISR	0.7	7.6	LaTIS	114.6	114.3	113.6		Excellent	Ex	NISN - MAX - Internet2 - PNW
PA, Penn State	MISR	0.6	2.6	LaRC PTH	59.5	58.7	52.7		Excellent	Ex	NISN - MAX - 3ROX
TN, ORNL	MODIS	10.1		GSFC-ENPL	456.7	270.6	125.3		Excellent		MAX - ESnet
TX, U Texas-Austin	MODIS	0.7	11.1	GSFC-ESDIS-PTH	173.9	87.1	41.6	0.2	Excellent	Ex	NISN - MAX - Internet2 - TX-learn
WA, U Washington	MISR	2.4	2.4	LaRC DAAC	n/a	n/a	n/a				Internet2 via NISN / MAX
Canada, U. of Toronto	MOPITT, GEOS	0.1	0.6	LaRC DAAC	62.1	60.2	17.6		Excellent	Ex	NISN - StarLight (Chicago) - CA*net
Canada, CCRS: Ottawa	CEOS, MODIS	1.1	3.8	GSFC-MODIS	93.8	78.4	61.3	5.7	Excellent	Ex	EBnet - MAX - Internet2 - CA*net
Italy, Ispra (JRC)	MISR	9.7	0.1	LaRC DAAC	n/a	n/a	n/a				NISN / MAX / Géant (DC) / GARR
Japan, JAXA	MODIS, PPS	3.5	0.5	GSFC-MODIS	n/a	n/a	n/a				EBnet - MAX - Internet2 - LA - TransPAC
New Zealand, U Auckland	MISR	0.3	0.3	LaRC PTH	n/a	n/a	n/a				NISN - StarLight (Chicago) - PNW - PacWave
UK, Oxford	HIRDLS	0.4	0.5	GSFC-ENPL-PTH	795.8	781.7	205.9	0.33	Excellent	Good	MAX - Géant (DC) - JAnet
UK, BADC (RAL)	HIRDLS	0.2	0.2	GSFC-ESDIS-PTH	29.6	23.1	15.0		Excellent	Ex	EBnet - MAX - Géant (DC) - JAnet
UK, London (UCL)	MISR, MODIS	0.6	1.0	LaRC PTH	34.3	29.2	16.7		Excellent	Ex	NISN - MAX - Géant (DC) - JAnet

*Rating Criteria:	
Excellent	Median Daily Worst >= 3 * **Requirement**
Good	Median Daily Worst >= **Requirement**
Adequate	Median Daily Worst < **Requirement** <= Median Daily Median
LOW	Median Daily Median < **Requirement**
BAD	Median Daily Median < **Requirement** / 3

Summary		
Rating	Current: 2-3 Q 2012	Prev Report
Excellent	13	10
Good	1	2
Adequate	0	0
LOW	0	0
BAD	0	0
Total	14	12
GPA	3.93	3.83

EOS QA SCF Sites

Daily Median and Worst Performance as a percent of Requirements



Details on individual sites:

Each site listed below is the DESTINATION for all the results reported in that section. Other tests are also listed. The three values listed are derived from [nominally] 24 tests per day. For each day, a daily best, worst, and median is obtained. The values shown below are the medians of those values over the test period.

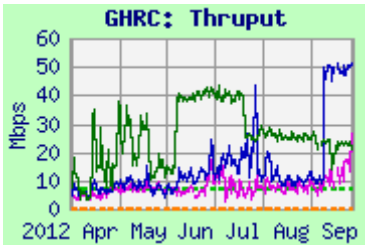
1) AL, GHRC (UAH) (aka NSSTC)

Rating: Continued **Good**

Teams: AMSR, MODIS, LANCE
Domain: nsstc.uah.edu
Web Page:http://ensight.eos.nasa.gov/Missions/terra/NSSTC.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-EDOS	22.3	10.3	4.0	NISN
GSFC-EDOS	11.6	6.9	2.4	MAX / I2 / SOX
LaRC-PTH	36.3	25.0	19.0	NISN / MAX / I2 / SOX



Requirements:

Source Node	FY	Mbps	Rating
MODIS	'12 –	2.9	Good

Comments: Testing was initiated in December '10 from GSFC-EDOS via both NISN and Internet2 for LANCE flows. Testing for CERES was discontinued from LaRC-PTH – there is no longer a requirement (was 6.9 mbps). Testing between GHRC, RSS and NSIDC for AMSR-E (AQUA) is now in the "Production Sites" report.

The median daily worst case from EDOS via NISN was above the MODIS requirement, but by less than 3 x so the rating remains **Good**.

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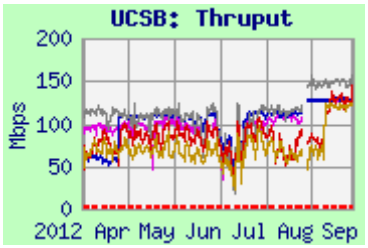
2) CA, UCSB :

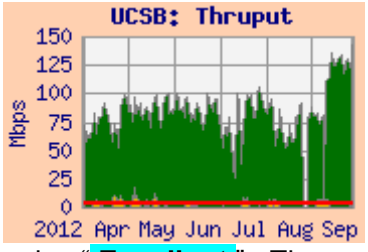
Ratings: GSFC: Continued **Excellent**

Teams: MODIS
Domain: ucsb.edu
Web page: http://ensight.eos.nasa.gov/Missions/terra/UCSB.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-MODIS	87.6	67.9	45.6	MAX / I2 / CENIC
GSFC-GES DISC	103.7	83.9	58.0	
GSFC-ENPL	116.4	99.1	76.7	
EROS-LPDAAC	112.8	109.4	89.3	StarLight / I2 / CENIC
EROS-PTH	132.7	112.4	77.2	





Requirements:

Source Node	FY	kbps	Rating
GSFC	'12 -	170	Excellent

Comments: The GSFC requirement was reduced (was 3.1 mbps), and the EROS requirement was eliminated (was 2.2 mbps).

Thruput from all sites is pretty stable. The rating from GSFC-MODIS remains "**Excellent**". The user flow from GSFC averaged 1.7 mbps this period, close to typical and the old requirement (without the 50% contingency). The user flow from EROS averaged 0.7 mbps this period, well below the old requirement.

Performance from EROS-LPDAAC and EROS-PTH improved in August with a switch to the EROS production server, outside the firewall, and from EBnet (GSFC-MODIS and GSFC-GES DISC) in September due to the EBnet firewall upgrade.

3) HI, University of Hawaii:

Ratings: GSFC: **Excellent**

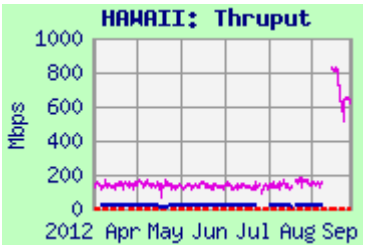
Team: MODIS
Domain: ucsd.edu
Web Page: http://ensight.eos.nasa.gov/Missions/terra/HAWAII.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-ESDIS-PS	31.3	21.9	7.6	MAX / I2 / LA / UHnet
GSFC-ENPL	322.6	138.5	83.8	

Requirements:

Source Node	FY	kbps	Rating
GSFC-ICESAT	'12 –	21	**Excellent**



Comments: Testing was initiated to a PerfSonar node at UH in April, based on a [very small] MODIS requirement in the new ICD. Performance was noisy but stable from both sources. Thruput from GSFC-ENPL was better than from GSFC-ESDIS-PS due to using multiple streams, and improved much further in September when testing was switched to a better PerfSonar node.

The thruput from both sources is much more than the tiny requirement, so the rating is "**Excellent**"

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4) IL, UIUC:

Rating: LaRC: **Excellent**

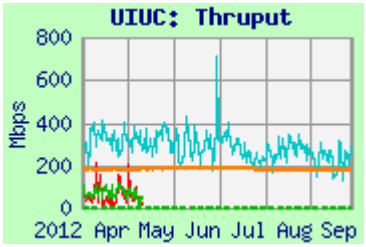
Teams: MISR
Domain: uiuc.edu
Web page: http://ensight.eos.nasa.gov/Missions/terra/UIUC.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
LaRC PTH-SCP	111.6	66.8	21.9	NISN / StarLight / I2
LaRC PTH	185.4	183.4	176.2	
GSFC-NISN-SCP	242.4	40.0	12.0	MAX / I2
GSFC-NISN	483.9	279.7	138.4	

Requirements:

Source Node	FY	kbps	Rating
LaRC ASDC	'12 -	556	**Excellent**



Comments: Testing was added to UIUC in August '10. Initially, SCP testing was initiated from GSFC and LaRC, sending files to UIUC. SCP thruput was noisy from both sources, somewhat bimodal.

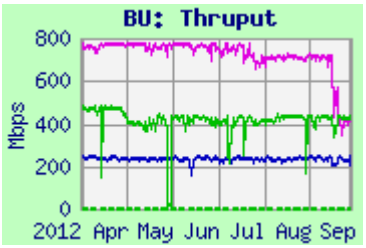
In October '10, nuttcp testing was added, initiated by UIUC, receiving from GSFC and LaRC. Thruput on these tests is steadier than SCP, but much lower, apparently due to significant incoming packet loss (which is causing the noisiness on the SCPs as well).

In late March, testing from GSFC-NISN and LaRC PTH was switched to a PerfSonar server at UIUC, with greatly improved thruput. The SCP tests were discontinued in May. The thruput on the PerfSonar tests was well above the revised requirement (was 1.1 mbps previously); the rating remains **Excellent**.

5) MA, Boston Univ:

Ratings: EROS: Continued **Excellent**
LaRC: Continued **Excellent**

Teams: MODIS, MISR Domain: bu.edu
Web Page: http://ensight.eos.nasa.gov/Missions/terra/BU.shtml

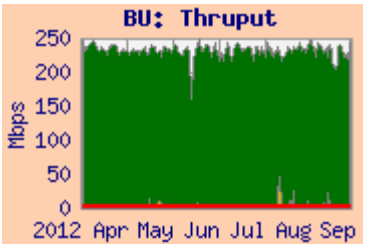


Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
EROS LPDAAC	246.9	233.7	174.2	StarLight / I2 / NOX
GSFC ENPL	775.0	748.9	548.7	MAX / I2 / NOX
LaRC ASDC	443.9	425.6	164.1	NISN / MAX / I2 / NOX

Requirements:

Source Node	FY	mbps	Rating
EROS LPDAAC	'12 -	2.6	**Excellent**
LaRC ASDC DAAC	'12 -	0.7	**Excellent**



Comments: BU is well connected. Thruput from all sources was very stable, and much better than the [revised lower, was 3.0 mbps] requirements, rating "**Excellent**". From EROS LPDAAC, the user flow (shown on the integrated graph) averaged about 1.7 mbps for this period – close to the requirement without contingency. Thruput from GSFC and LaRC ASDC DAAC also greatly exceeded the requirements. User flow from GSFC was above average at 3.6 mbps.

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6) OR, Oregon State Univ:

Ratings: LaRC ANGe: Continued **Excellent**

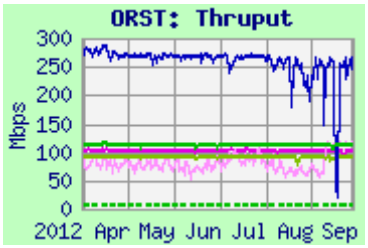
Teams: MISR Domain: oce.orst.edu
Web Page:http://ensight.eos.nasa.gov/Missions/terra/ORST.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
LaRC ANGe (LaTIS)	114.6	114.3	113.6	NISN / MAX / I2 / PNW
JPL	273.7	267.1	231.4	CENIC / I2 / PNW
GSFC-ESDIS-PTH	96.8	77.6	55.9	MAX / I2 / PNW
GSFC-ENPL	106.4	102.5	97.9	

Requirements:

Source Node	FY	kbps	Rating
LaRC ANGe	'12 -	694	**Excellent**
GES DISC	'02 – '11	250	**Excellent**



Comments: The requirements were reduced (was 7.6 mbps from LaRC) since the requirements for CERES and MODIS have been eliminated. Thruput was mostly stable from all sources for this period, and was well above the requirements. The rating from LaTIS remains "**Excellent**". Results from the East coast sites are limited by a small window size at ORST. Thruput from GSFC-ESDIS-PTH dropped in late February, due to EBnet packet loss, and improved in September, with the EBnet firewall upgrade.

7) PA: Penn State Univ:

Rating: Continued **Excellent**

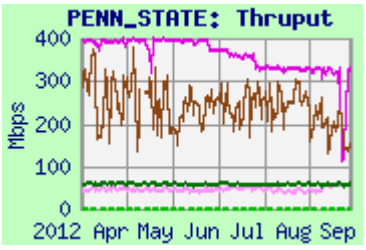
Team: MISR

Domain: psu.edu

Web Page: http://ensight.eos.nasa.gov/Missions/terra/PENN_STATE.shtml

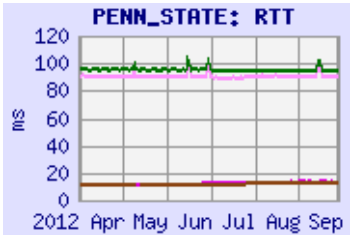
Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
LaRC-PTH	59.5	58.7	52.7	NISN / MAX / I2 / 3ROX
GSFC-ESDIS-PTH	51.9	45.0	35.5	MAX / I2 / 3ROX
GSFC-ENPL	376.2	372.2	327.5	
GSFC-ESTO	311.3	246.2	163.6	



Requirements:

Source Node	FY	kbps	Rating
LaRC DAAC	'03 -	556	**Excellent**



Comments: Thruput from NISN sources is much lower than from non-NISN sources, due to much longer RTT. Note that the forward route (to PSU) is OK (see above), but the return route to LaRC and GSFC-ESDIS-PTH is much longer -- now via peering with NISN in Chicago! But due to the low [reduced from 2.6 mbps] requirement, the rating remains **Excellent**.

Thruput from GSFC-ESDIS-PTH dropped in late February, due to EBnet packet loss, and improved in September, with the EBnet firewall upgrade.

From GSFC-ESTO (on the SEN at GSFC, not EBnet) and from GSFC-ENPL (direct GigE to MAX), the RTT is lower (due to the optimum return route), and the thruput is much higher than from other sources.

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8) TN, Oak Ridge National Lab:

Rating: GSFC: **Excellent**

Teams: MODIS, DAAC

Domain: ornl.gov

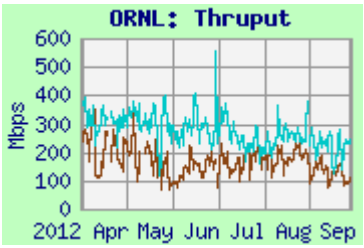
Web Page: http://ensight.eos.nasa.gov/Missions/terra/ORNL.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-NISN	456.7	270.6	125.3	NISN / MAX / ESnet
GSFC-ESTO	232.9	163.1	103.1	MAX / ESnet

Requirements:

Source Node	FY	mbps	Rating
GSFC	'12 -	10.1	**Excellent**



Comments: Thruput was noisy but mostly stable from both sources to a PerfSonar node at ORNL. Performance was well above the requirement; the rating is therefore **Excellent**".

9) TX: Univ. of Texas - Austin:

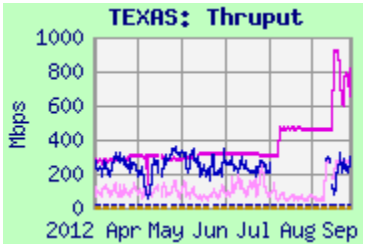
Rating: Continued **Excellent**

Team: MODIS, ICESAT Domain: utexas.edu

Web Page: http://ensight.eos.nasa.gov/Missions/icesat/TEXAS.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-ICESAT	368.3	245.7	112.8	NISN / MAX / I2 / TX
GSFC-ENPL-PTH	321.9	318.9	289.8	MAX / I2 / TX
GSFC-ESDIS-PTH	173.9	87.1	41.6	



Requirements:

Source Node	FY	kbps	Rating
GSFC-MODIS	'12 -	666	**Excellent**

Comments: Thruput from ICESAT was mostly steady, and well above the previous 10 mbps requirement. The previous 11.1 mbps ICESAT requirement has been eliminated, however.

Thruput from GSFC-ESDIS-PTH dropped in late February, due to EBnet packet loss, and improved in September, with the EBnet firewall upgrade. Even before this improvement, the thruput was well above 3 x the requirement, so the rating remains **Excellent**.

From GSFC-ENPL, outside most of the congested GSFC campus infrastructure, thruput is less noisy. This test was moved to a PerfSonar node at UT in August, and retuned in September, with greatly improved results. [The test from ESDIS-PTH remains to the SCF].

The average user flow this period was only 180 kbps, about 25% of the MODIS requirement.

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10) Canada, Univ of Toronto:

Rating: GSFC: Continued **Excellent**
LaRC: Continued **Excellent**

Team: MOPITT Domain: utoronto.ca

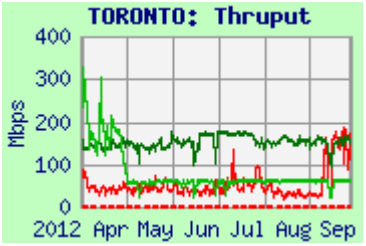
Web Page: http://ensight.eos.nasa.gov/Missions/terra/TORONTO.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
LaRC ASDC DAAC	62.1	60.2	17.6	NISN / StarLight / CA*net
LaRC PTH	172.7	149.2	116.3	
GSFC-ESDIS-PS	72.3	39.0	22.9	MAX / I2 / NY / CA*net

Requirements:

Source Node	FY	kbps	Rating
LaRC DAAC	'02 -	100	**Excellent**
GSFC EOC	'02 -	512	**Excellent**



Comments: Thruput from LaRC ASDC DAAC dropped in late April due to problems at ASDC. Other destinations dropped similarly from LaRC ASDC at the same time; however, no such drop was observed from LaRC PTH, indicating that the problem was not a network problem but was local to LaRC ASDC.

Testing from GSFC-ESDIS-PS dropped in late February, due to EBnet packet loss, and improved in September, with the EBnet firewall upgrade.

The ratings from both sources remain **Excellent**, due in part to the low requirements.

User flow from GSFC averaged only 27 kbps this period.

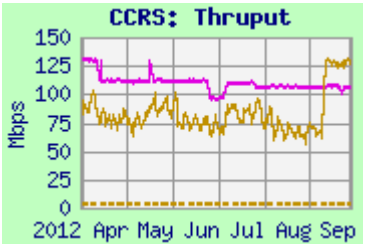
11) Canada: CCRS (Ottawa)

Rating: Continued **Excellent**

Teams: MODIS, CEOS
Domain: ccrs.nrcan.gc.ca
Web Page: http://ensight.eos.nasa.gov/Missions/terra/CCRS.shtml

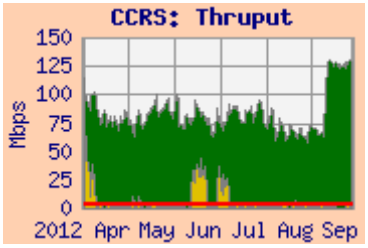
Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-MODAPS	93.8	78.4	61.3	MAX / I2 / CA*net
GSFC-ENPL	113.0	109.7	105.7	



Requirement:

Source Node	FY	mbps	Rating
GSFC-MODAPS	'11 -	1.1	**Excellent**



The MODIS requirement was reduced from 3.8 mbps previously.

Thruput from GSFC-MODAPS dropped in late February, due to EBnet packet loss, and improved in September, with the EBnet firewall upgrade. It remained much more than 3 x the requirement, so is rated **Excellent**.

User flow from GSFC averaged 5.7 mbps this period, above even the previous requirement.

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12) UK, Oxford Univ.:

Rating: Continued **Excellent**

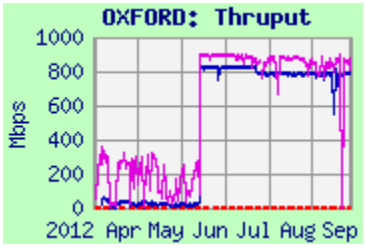
Team: HIRDLS
Domain: ox.ac.uk
Web Page: http://ensight.eos.nasa.gov/Missions/aura/OXFORD.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-ENPL	894.3	832.4	286.9	MAX / I2 / Géant (DC) / JAnet

Requirements: (IST Only)

Source Node	FY	kbps	Rating
GSFC	'03 –	368	**Excellent**



Comments: Beginning in late March, testing was switched to a PerfSonar server at Oxford, using iperf. Testing previously had used, "flood pings", which is a poor substitute for iperf, and provided much lower results. Performance improved again in June when the Oxford PerfSonar node was upgraded. The rating continues **Excellent**.

User flow from GSFC to Oxford averaged only 330 kbps for this period, very close to the requirement (vs. 700 kbps last period).

13) UK, London: (University College)

Rating: Continued **Excellent**

Teams: MODIS, MISR Domain: ucl.ac.uk

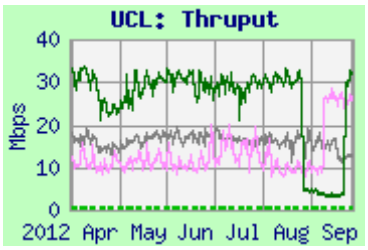
Web Page: http://ensight.eos.nasa.gov/Missions/terra/UCLSCF.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
LaRC PTH	34.3	29.2	16.7	NISN / MAX / Géant / JAnet
GSFC-ESDIS-PTH	18.1	11.0	7.2	MAX / I2 / Géant (DC) / JAnet
EROS-PTH	20.3	16.2	8.2	StarLight / I2 / Géant (DC) / JAnet

Requirements

Source Node	FY	kbps	Rating
LaRC DAAC	'12 –	556	**Excellent**



Comments: Testing since November and December '10 is by nuttcp pulls, initiated at UCL.

NISN began peering with Géant in September '09, with improved thruput from LaRC. Previously, the route from LaRC was via NISN peering with Teleglobe on the US west coast, unnecessarily increasing RTT and reducing thruput.

The median daily worst thruput from LaRC remained well above 3 x the requirement, so the rating remains "**Excellent**"

From GSFC-ESDIS, thruput was a bit lower and noisier. Performance dropped in late February, due to EBnet packet loss, and improved in September, with the EBnet firewall upgrade.

Thruput from EROS is lower than the other sites, due to a longer RTT.

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14) British Atmospheric Data Centre

Rating: Continued **Excellent**

(Rutherford Appleton Laboratory) Team: HIRDLS Domain: rl.ac.uk

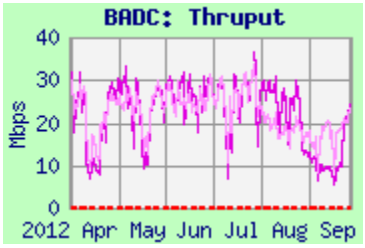
Web Page: http://ensight.eos.nasa.gov/Missions/aura/UK_RAL.shtml

Test Results:

Source Node	Medians of daily tests (mbps)			Route
	Best	Median	Worst	
GSFC-ENPL	33.9	24.7	13.1	MAX / I2 / Géant (DC) / JAnet
GSFC-ESDIS-PTH	29.6	23.1	15.0	

Requirements:

Source Node	FY	kbps	Rating
GSFC	'02 –	190	**Excellent**



Comments: Thruput from GSFC-ENPL was similar to that from GSFC-ESDIS-PTH. The thruput has consistently been much higher than the requirement, so the rating remains "**Excellent**".